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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/086,440	03/04/2002	Young-hun Min	1293.1338	4013
21171	7590	10/08/2003	EXAMINER	
STAAS & HALSEY LLP SUITE 700 1201 NEW YORK AVENUE, N.W. WASHINGTON, DC 20005			HASAN, MOHAMMED A	
			ART UNIT	PAPER NUMBER
			2873	

DATE MAILED: 10/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/086,440

Applicant(s)

MIN ET AL.

Examiner

Mohammed Hasan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133)
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 58 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 13 - 34, 46 - 58 is/are allowed.
- 6) ☒ Claim(s) 1,2,35 and 36 is/are rejected.
- 7) ☒ Claim(s) 3 - 12, 37 - 45 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other: ____

DETAILED ACTION

Priority

1. Receipt of acknowledged of papers submitted under 35 U.S.C. 119 (a) – (d), which papers have placed of record in the file.

Oath/Declaration

2. Oath and declaration filed on 3/4/2002 is accepted.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 35 and 36 are rejected under 35 U.S.C. 102 (b) as being anticipated by Nelson (5,212,582).

Regarding claims 1,2, 35 and 36 Nelson discloses (refer to figures 1, 2, and 3) a micromirror driver (10) (e.g., a beam steering device) comprising a micromirror (16) having at least one groove (e.g., flexible hinge as shown in figure 2) , an elastic body

(12) which supports the micromirror in rotation (column 2, lines 30 – 39) and at least one electrode (34) which controls the rotation of the micromirror by generating electrostatic forces through interaction between the micromirror at least one electrode (34) according according to a voltage of the at least one electrode, wherein an amplitude and a frequency of the rotation of the micromirror are controlled by varying one of a magnitude and a waveform of the voltage of the at least one electrode (34) (column 4, lines 61 – 68, column 5, lines 1 – 2).

Regarding claim 2, Nelson discloses (column 4, lines 23 – 36) at least one groove (30) near a rotation axis of the micromirror.

Regarding claim 35, Nelson discloses (refer to figures 1,2, and 3) a method of controlling a micromirror driver (10), which comprises a micromirror (16) an elastic body (12) supporting the micromirror in rotation , and at least one electrode (34) which control the rotation of the micromirror by generating electrostatic interaction between the micromirror and the at least one electrode according to a driving voltage the method comprising : controlling a resonant frequency of the micromirror by varying the waveform of the driving voltage of the at least one electrode (34) (column 4, lines 61 – 68, column 5, lines 1- 2).

Regarding claim 36, Nelson discloses (column 4, lines 61- 68, column 5, lines 1- 2) controlling an amplitude of the micromirror by varying a magnitude of the driving voltage of the at least one electrode (34).

Allowable Subject Matter

4. Claims 13 – 34, and 46 – 58 are allowed.

5. The following is an examiner's statement of reasons for allowance: The prior art taken either singularly or in a combination fails to anticipate or fairly suggest the limitations of the independent claims, in such a manner that a rejection under 35 U.S.C. 102 or 103 would be proper. The prior art fails to teach a combination of all the claimed features as presented in independent claims, for example which include a micromirror having at least one groove and comprising a base electrode formed on the groove, at least two electrode which electrostatically interact with the base electrode to rotate the micromirror, and the two electrode operates independently (claim 13) ; a method of controlling micromirror device , the method comprising : generating electrostatic forces between the micromirror in response to voltage V to the at least one electrode and the voltage V satisfy an equation $V^2 = V_0 + \alpha\theta$, where V_0 represents an initial voltage of the at least one electrode, α represents an arbitrary coefficient and θ represents a rotation angle of the micromirror and controlling a frequency or in an amplitude of the micromirror by varying the initial voltage V_0 of the at least one electrode and the arbitrary coefficient α (claim 25) ; a micromirror having an outer edge and a rotation axis, the mirror comprising : a base electrode having a first portion formed along the outer edge of the mirror, and a second portion formed between the outer edge of the micromirror and the rotation axis, first and second driver electrodes which electrostatically interact with the first and second portions of the base electrode and the

first voltage controls an amplitude of the micromirror and the second voltage controls a resonant frequency of the micromirror (claim 46 and claim 55), the micromirror having a base electrode, a first portion of the base electrode formed along an edge of the micromirror and a second portion of the base electrode formed between the first portion of the base electrode and the rotation axis and the first and the second electrode disposed near the first and the second portion of the base electrode and the method comprising: applying a voltage (V_1) to the first driver electrode, satisfies an equation $V_1^2 = V_0$ to control an amplitude of the micromirror, and applying a voltage (V_2) to the second driver electrode where V_2 satisfies an equation $V_2^2 = \alpha\theta$, and adjusting α to control a frequency of the micromirror, V_0 represents an initial voltage at the electrodes, θ represents a rotation angle of the micromirror (claim 53).

6. Claims 3 – 12, 37 – 45 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter: The prior art fails to show a first electrode which controls the frequency of rotation of the micromirror, the second electrode which controls the amplitude of rotation of the micromirror, where the second electrode operates independently of the first electrode, the voltage (v) of the at least one electrode satisfies an equation $V^2 = V_0 + \alpha\theta$, where V_0 represents an initial voltage of the at least one electrode, α represents an arbitrary coefficient and θ represents a rotation angle of the micromirror, at least one groove comprises a plurality of grooves symmetrically arranged with respect to a

rotation axis of the micromirror, the plurality of electrodes is formed in a comb shape so an effective area of each of the plurality of electrodes which interacts with the micromirror is maximized, at least one electrode comprises a first electrode and the method further comprises setting a voltage (V_1) of the first electrode to satisfy an equation $V_1^2 = V_0$ where V_0 represents an initial voltage of the at least one electrode, a method further comprises setting a voltage (V_2) of the second electrode to satisfy an equation $V_2^2 = \alpha\theta$ where α represents an arbitrary coefficient and θ represents a rotation angle of the micromirror, setting of the voltage V_1 of the first electrode is independent of setting of the voltage V_2 at the second electrode, the resonant frequency f of the micromirror is expressed by an equation $f = 1/2\pi \text{ SQRT } K_t - \gamma_2\alpha / I$, $f = 1/2\pi \text{ SQRT } K_t + \gamma_2\alpha / I$, where K_t represents a spring constant of the elastic body, I represents an inertia momentum of the micromirror, γ_2 represents a variation of capacitance with respect to a variation of a rotation angle θ of the micromirror.

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Yamada et al (5,959,760) discloses a light beam scanner includes a supporting substrate. Fixed electrodes of a first set are provided on the supporting substrate to oppose to each other. A mirror is provided between the fixed electrodes, has torsion bars physically connected to the supporting substrate and a mirror electrode section in end portions of the mirror opposing to the fixed electrode at least.

Ueda et al (4,421,381) discloses a mechanical vibrating element which can be used as a resonator made operative to resonate in a predetermined frequency, a filter

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having a frequency selecting property or an optical deflector adapted to be mechanically dislocated in accordance with an input signal for deflecting an optical beam.

Yoon (5,506,720) discloses method for manufacturing an electrodisplactive actuated mirror array.

Min (5,552,923) discloses array of electrodisplactive actuated mirrors and method for the manufacture thereof.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mohammed Hasan whose telephone number is (703) 306-0089. The examiner can normally be reached on M-TH, 7:00 AM to 5:30 PM.

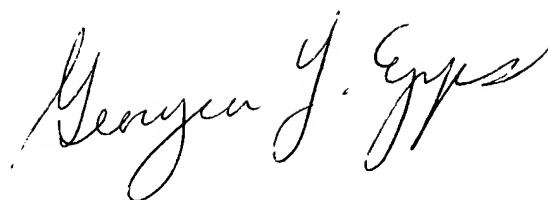
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on (703) 308-4883. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

MH
September 23, 2003

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A handwritten signature in black ink, reading "Georgia J. Epps". The signature is written in a cursive, flowing style with a large initial 'G' and 'E'.

Georgia Epps
Supervisory Patent Examiner
Technology Center 2800